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CUTANEOUS, KINÆSTHETIC, AND MISCELLANEOUS SENSES

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Cutaneous Sensation.—The experiments of Head upon the cutaneous sensibility of areas supplied by regenerating nerves have been repeated by Trotter and Davies (21). These authors follow Head's method, severing three sensory nerves in different parts of the body. The first result of the operation is complete loss of sensibility in the central part of the area supplied by the nerve, this region being surrounded by a hypoæsthetic zone. The authors do not, as did Head, find that the different forms of sensibility return in two groups, but rather that all forms return together. All returning sensibility shows the two phenomena of Intensification and Peripheral Reference, and most of the peculiarities of the sensibility of an area supplied by a regenerating nerve may be grouped under these two heads. Intensification is defined as "a qualitative change in the sensations elicited from a recovering area which makes them abnormally vivid." Peripheral reference is "the peculiarity of recovering areas whereby sensations, instead of, or in addition to being felt at the place stimulated, are felt in the distal part of the affected area." The authors cannot agree with Head in assuming that there are two systems of nerve fibers, one for "epicritic" and the other for "protopathic" sensibility and that in regeneration one system regains its functions before the other. They think that Head was led to the belief that sensitivity to heavy touch regenerated before that to light touch because the latter appeared at first in a form so hypoæsthetic that it was not observed.

Fabritius and von Bermann (9) succeed in producing artificially a state in which the skin of a member loses its sensibility, by tying it up tightly with a rubber band for from 60 to 80 minutes. One or more fingers, and sometimes the whole hand were treated in this way. With the finger in this condition the authors determined two things, the effect upon the spatial threshold and the difference threshold for lifted weights. They find that for about 35 or 45 minutes after the tying-up there is just a slight rise in the two-point threshold. During the next 5 to 7 minutes, however, it increases so rapidly that at the end of this time it is too large to be determined on the finger. Sensitivity to pressure with good localization of single stimuli still remains, though the stimulus-threshold is, of course, raised. Within the next 5 to 10 minutes the last trace of pressure-sensitivity has vanished. The authors also determine the difference-threshold for lifted weights at different stages, and they find that this form of sensibility decreases along with decrease of tactile sensitivity. The authors conclude that sensitivity to lifted weights depends upon sensations from the member itself rather than upon those from the muscles which effect its movement, since the latter are not affected by the rubber band. Thus they believe that the muscle-sensations play a very small part in the judgment of lifted weights.

A study of the accuracy of localization of touch stimuli on different parts of the body is made by Franz (10). Nine different parts of the body are chosen for investigation, a number of spots being marked out and tested on each part. The average error of localization was approximately the same for all subjects on the same parts of the body, but there are fairly large differences between the different parts of the body. In respect to the accuracy of localization the parts investigated rank in the following order: cheek, foot, chest, forearm, abdomen, thigh, upper arm, lower leg, back. There was no conclusive evidence of any tendency to localize the stimuli in definite directions, nor any correlation between the length of bodily hair on a part and the accuracy of localization there. Special tests were made to discover the relation, if any exist, between the localization-error and the two-point threshold. No constant relation appeared, though the average localization-error was always found to be smaller than the two-point threshold. Stimuli to a part were sometimes localized on an opposing part, for example near the axilla there were localizations on the chest when the arm was stimulated and vice versa.

Ponzo (17) continues his cutaneous work with a study of the accuracy of localization of thermal stimuli. With carefully constructed apparatus he obviates the difficulty of giving a thermal stimulus without at the same time arousing touch receptors. He finds that errors of localization on the finger, forearm, and upper arm, are greater for heat than for cold. Comparing these results with those previously obtained by him for other forms of cutaneous sensibility, he finds that the accuracy of localization runs in the following order: pain, touch, cold, heat. Another study of the temperature sense is made by Basler (4) who experiments to find at what rate temperature stimuli must follow each other in order to fuse into a continuous percept. The stimuli were given by a revolving apparatus which the author calls a "*thermische Reizmühle*." He finds that cold stimuli have to follow each other more quickly than do warm in order to be fused. Both cold and warm stimuli fuse with a slower succession-speed on the palm of the hand than they do on the arm. Wohlgemuth (24) describes two new pieces of apparatus for work in thermal sensations. These are designed to supply the need of apparatus with fine points which are capable nevertheless of maintaining a constant temperature that can be exactly measured at any time.

Martin, Porter, and Nice (16), using improved methods, determine the threshold of faradic stimulation in man. Three different types of electrodes were used, one applied to the lip, and two to the fingers. Introspections of the subjects seem to show that different types of receptors are stimulated by different electrodes. The authors compare the threshold obtained with that for various activities in animals, and find that the sensitivity of the human skin to this kind of stimulation is about 1/2 that of frog's muscle, and from 1/10th to 1/20th that of naked nerve.

Basler (2) finds the smallest rate at which a point drawn across the skin is recognized as such, and also the smallest excursion of the point which can be perceived. A hard rubber point drawn across the skin by clock-work is recognized as such when it moves at the rate of 0.1 mm. per second. As for distance, he finds that the movement is observable when the point makes an excursion of .02 mm., but not when it moves only .01 mm. Benussi (5) is interested to find under what conditions two stimuli, applied successively to two neighboring points on the skin, fuse into an illusive perception of movement. Points various distances apart were investigated with stimuli given with different time intervals between

them. As long as the succession is slow the two impressions appear quite separate, and are related to two distinct stimulating objects. As the time interval is made smaller, the subject gets the impression that a single object has stimulated both points, and the subjective distance between them is made smaller. If the succession-speed is made still greater, the impression is that a single point, localized between the two, has been continuously stimulated, or that the stimulus has been moving along the skin.

Kinæsthetic Sensation.—Dearborn, in two articles (6, 7), describes an experiment undertaken to obtain a clearer understanding of the physiology of kinæsthesia. The experiment consisted in having the subjects reproduce a norm experienced kinæsthetically. The norms were two figures of different complexity. The subject was first blindfolded, and his hand, holding a pencil in ordinary writing grasp, was guided by the experimenter over the lines of the norm. He was then asked to draw the figure from the motor idea he had received. Other series followed in which the subject received instructions to give special attention to the movement sensations, and still others in which visual factors were admitted along with kinæsthetic ones. Deliberate attention to the conscious movement sensations tends to shorten the movements, and somewhat to lessen the angles between them. It has, therefore, an inhibitory effect. In the author's estimation, one of the most striking results is the prompt and accurate visualization of the figures—a translation of movement sensations into visual terms. This he thinks is evidence that there are subconscious kinæsthetic sensations in close connection with visual neurograms, and that this subconscious kinæsthesia represents the innate impulse to activity. Thus, there are two phases of motor control, one actuating and subconscious, the other inhibitory and conscious. He brings forward confirmatory evidence, and in his second article (7), goes on to develop a theory of the will based on the evidence afforded by this experiment of these two phases of kinæsthesia.

Basler (3) experiments to find how the tactual sense and the muscle sense compare in their ability to give us exact perceptions of small figures. He finds the muscle sense superior in this respect. His method is interesting. The figure was drawn upon a metal plate with glass ink, and the subject was made to follow it, blindfolded, with a metal stylus. Plate and stylus were so connected electrically that when the stylus ran off the non-conducting figure on to the bare plate it formed a contact and caused a telephone to

sound. The exploration of small figures in this way showed that they could be recognized if their lines and spaces were at least 1 mm. broad. The subjects were also able to recognize certain kinds of type. The author remarks that the tactual sense has its only practical value when it is used in connection with the inner touch sensations.

The object of Erismann's work (8) is to find out what underlies the sensation of movement. His method is to make a muscle work against various kinds of resistances, for this increases the intensity of the processes to be examined, and so offers a valuable basis of comparison with the contraction under normal conditions. The effect of the intensification of the sensations in this way is in every case a marked underestimation of the extent of the movement. Other variations are also introduced, the most significant being variation of the speed of the movement and distraction of the attention from the movement. It is found that neither of these effects an underestimation, and the illusion must therefore be attributed to changes in the member itself. The skin is hardly influenced by the resistances introduced. The joints, if they are affected at all, should, as shown in other experiments, give more accurate estimations instead of underestimations. The author concludes, therefore, that the illusion is to be attributed to the muscle and tendon sensations, and these he thinks should be given a more important place than hitherto in theories of kinæsthetic perception. Truschel (22) uses somewhat the same method, but with a different purpose. His object is to find out whether in our judgment of the distance moved against a resistance we depend upon the strength sensations immediately involved, or, as has often been assumed, upon secondary criteria. He concludes that such judgments are made on the basis of the immediate strength sensations involved.

A study of the part played by kinæsthesia in the perception of rhythm is made by Ruckmich (20). He finds that kinæsthesia is generally most prominently connected with the first perception of the type and form of the rhythm. The kinæsthetic processes observed during the perception of a rhythm vary greatly in texture, clearness, intensity, and meaning or reference. Individuals vary greatly in the amount of kinæsthesia they have, in its type, and in the degree of its prominence. Kinæsthesia, so important for the initial perception of a rhythm, can, after this has once been established, give way to auditory or visual processes which represent it.

Wirth and Klemm (23) continue the study of the meaning of stimulus-times for the estimation of intensity by carrying it into the realm of sense-perceptions which depend upon inner touch sensations. It is found that inner touch sensations reach their maximum intensity with much smaller times than do pressure sensations. The latter have been found to reach their maximum at 1 second, while it is here found that inner touch sensations reach theirs with times of from 1/10 to 1/4 of a second. Shorter times are interpreted as quicker, longer times as slower movements.

Miscellaneous Sensations.—Magnus and de Kleijn (15) analyze the effects of one-sided extirpation of the labyrinth with special regard to the connection of the labyrinth with the tonus of bodily muscles. Previous experiments have convinced these authors that bodily tonus is a system of very complicated reflexes, dependent partly upon the labyrinth and partly upon the neck-reflex. Four different kinds of animals are used, rabbits, guinea-pigs, cats, and dogs. The symptoms resulting from extirpation are very carefully observed and thoroughly described, and are always distinguished from the results that follow the neck-reflex. The conclusion arrived at is that labyrinth tonus exists without a doubt, but that it is developed in different degrees in different animals. Moreover, the neck-reflex has a great, and in some cases a preponderating, influence upon the symptoms which follow one-sided labyrinth extirpation. Another study of the labyrinth is made by Popp (18). He stimulates the labyrinths of doves with warm and cold stimuli by inserting a little rubber sack attached to a double cannula through which water of the desired temperature is allowed to circulate. The particular advantage of this apparatus is that it can be so arranged that only one ampulla is stimulated. He finds that warming the ampulla externa is followed by the same head-turning and the same nystagmus as when the animal is so whirled that the endolymph flows from the smooth end of the semi-circular canal to the ampulla. Cooling has the opposite effect. Warming has the same effect upon the ampulla posterior as whirling the animal so that the endolymph flows from the ampulla to the smooth end, and cooling has again the opposite effect.

Bárány and Rothfeld (1) experiment upon the vestibular apparatus in cases of intoxication and delirium tremens. The most important conclusion reached by these authors is that the disturbances which come as a result of acute alcohol poisoning, as well as in delirium tremens, have their seat in the cortex of the cerebellum.

Rothfeld (19) contributes a study of the effects of certain drugs upon the vestibular eye-reflex of rabbits. He finds that under the influence of narcotics the quick components of nystagmus disappear in the following order: (*a*) vertical, (*b*) rotary, (*c*) horizontal. He describes in detail the specific action upon the vestibular eye-reflexes of chloroform and ether and of paraldehyde.

Gertz (12) makes a quantitative determination of the amount the eyes move as a result of movement of the head. He does not believe these compensatory movements to be due solely to the action of the labyrinth, but thinks that other factors are also active in controlling them.

Three authors, Maas (14), Goldstein (13), and Freund (11), treat the phenomenon of the disturbance of the weight-sensation, and show its importance as a diagnostic symptom. It was first described by Lotmar in 1908, and he ascribed it to injury of the cerebellum. The cases reported by these authors in which the patients' sensitivity to weight-discrimination had been interfered with, all tend to support Lotmar's hypothesis. They succeeded in locating cerebellar injuries, though they could not show that the disturbances are due solely to this cause.

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AFFECTIVE PHENOMENA — DESCRIPTIVE AND THEORETICAL

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Emotional states, attitudes and functions, as distinguished from simple "affection," are the subjects of nearly all the literature here to be noticed, and there is a distinct tendency to treat them from the social-psychological point of view. Boigey (2), an army surgeon, deals with the passions mainly as moral diseases, the evolution of which is intimately bound up with our bodily activities

and our heredity. His descriptions follow traditional lines; his remarks on the treatment of the passions is generally sensible. Cartault (4) is interested, like Shaftesbury and other English moralists, to show that human nature is possessed of generous, as well as selfish, sentiments, and that these constitute its glory. He distinguishes disinterested from generous sentiments as being more negative, reserved, detached, calm, whereas the latter are more lively, ardent and active for positive ends. Brown (3) takes up in a modern form the old question as to the significance and importance of the passions in the formulation of the moral ideal. The subject is treated under four heads,—the emotional elements and their organization, the problem of values, religious experience, and the relation of religion and morals. The argument makes use of Shand's doctrine of the sentiments, "one of the most important discoveries hitherto made in the realm of emotional psychology," and culminates in asserting the power of the religious sentiment centered about the idea of God to produce without deformation a many-sided development of character. Incidentally the value of music is considered; we learn, negatively, that the emotions represented by music are not those of everyday life, nor analogous to them, but the bearing of this on the dynamic relation of music and morals is left to conjecture. Taylor (27) professes "to give a definition of Moral Sense" in notes on the emotions said to be "clinical," but what it is is hard to discover. The mind is like a line with reason at one end and the emotions, of sexual origin, at the other.

A number of writers treat specifically of the socially important sentiments of sympathy, compassion, love, hate, shame and the like. Orelli (18) gives a useful historical survey of opinions concerning pity (compassion), on the basis of which he endeavors to found a doctrine. His analysis is defective, however, for in making its essential elements to consist in the "I" pitying, the "other" pitied, and the "suffering" of the pitied with which "I" suffer, he omits the very thing in question, namely, my pity, or, misled by etymology (*mit-leiden*), identifies two things, my pity and the other's suffering, which are distinct. This mistake is expressly condemned by Scheler (21), who explains the discrepancy by distinguishing between a state of feeling and a function of feeling. One may sympathize with another's joy without being oneself in a joyful frame of mind. The confusion complained of vitiates, in his view, genetic theories which derive sympathy either from *Einfühlung*, of which, he says, there is no need, since we directly perceive the

other's state in his expression of it, or from other processes of reproduction, imitation, etc. This last is the view of Nicoli (17) in terms of assimilation. With Shaftesbury, Hutcheson and A. Smith, Scheler regards sympathy as an ultimate, original function. Phylogenetic theories confuse it with emotional contagion and are wrong in principle, for the social instinct from which they derive it can lead to quite other results, e. g., cruelty and malignity. In a similarly independent fashion the same author treats of love and hate. These, he holds, are not feelings, but emotionally qualified elementary acts. Excluding all the accidents, the essence of love is declared to be the movement in which a value-bearing object attains its supreme value. Hate is the opposite movement. Contrary views are acutely criticized, notably Freud's. An entirely different question is that of the so-called "analysis" of hate, a case of which is reported by one of Freud's disciples, Wyrubow (28). A man otherwise kindly disposed hated cats and took pleasure in torturing them. The explanation was found in an experience of childhood, the long-forgotten memory which was aroused by associations starting from an erotic dream. The cure followed. Much, of course, is made of the sexual factors. Tait (26), whose article, reported here last year, has seemed important enough to be translated into Italian, also traced to early emotionally exciting, but forgotten, experience an otherwise inexplicable aversion.

The nature of sentiments or emotional attitudes (*Gesinnungen*), friendly or hostile, generally is the subject of elaborate discussion by Pfänder (19). He distinguishes actual, virtual and habitual sentiments, but in the present article deals only with the first. Actual positive sentiments—love, friendliness, etc.—are completely characterized as centrifugal, vivifying outstreamings of feeling in which the ego in a measure unites with the object and affirms it in peculiar acts; actual negative sentiments—hate, unfriendliness, etc., are similarly characterized as centrifugal outstreamings of feeling, of corroding virulence in which the ego in a measure separates itself from the objects and denies them in peculiar acts. An interesting section treats of sentiments which are not really serious, but are not necessarily hypocritical; they appear, e. g., in make-believe and quite commonly in conventional social intercourse. These *unechte Gesinnungen* are pale and schematic imitations. Haas (12) refers such feelings to a lack of inner harmony in the direction of the will.

Flatau (11) defines shame as a mental state in which there is a painful feeling of diminished personality. Its roots are in the

bodily sphere, from which they spread over into the psychical, its reaction is to concealment—even the blush, it is suggested, may be interpreted as a mask—and it is of great social significance. The author makes some discreet observations on this last topic, opposed alike to prudery and to licentiousness. The related subject of embarrassment is treated by Hellpach (13) with characteristic German thoroughness. He considers in turn its sources, its expressions, the metamorphosis of the expression and its secondary transformation. One of the more noteworthy features of the discussion is the tracing of the process by which the expressive movements first aim to conceal the embarrassment, next to overcome it and finally to simulate it, so that, e. g., they become in the *demi-mondaine* a means of allurement.

The ambiguity in our English word "humor" is suggested by the article of Dugas (7) when compared with that of Macnaughtan (16). The French writer's *humeur* is, of course, our "humor" in which every man is according to his mood. It would be interesting to trace the connection between this and the meaning which connects it with the ludicrous through the medium of the doctrine of the temperaments back to the medical and physiological theories of Hippocrates. Dugas contrasts it with character and emphasizes its instability. He does not consider its etiology. The other kind of humor is regarded by Macnaughtan as lying somewhere between the witty and the comic, compounded of both and finer than either. Sidis (23) makes it a species of wit. Both writers agree that the primitive man's idea of comedy was originally closely connected with torture. The former finds the essence of humor in truth, which means, perhaps, what the latter means when he speaks of it in its higher stages as seeing into the infinite depths of the soul in its very failures, faults and imperfections. Sidis connects laughter with surplus energy and the play impulse; his theory of the ludicrous is the same as Bain's. Benn (1) proposes a new theory of what Aristotle meant by catharsis of the tragic emotions, namely, that it is an effect of character and plot eliminating pain and leaving pleasure as the sole end of the tragic representation. The horror which replaces the pity that is first aroused is relieved by an appropriate adjustment of responsibilities and actions which remove the representation from any real contact with the actual life of the spectators. The theory is condemned, however, as resting on a false psychology.

Cohan and Nathan (5) enumerate the tricks and devices of

actors and playwrights for exciting the desired emotions in an audience. Dugas (8) charges the James-Lange theory with flouting consciousness and identifying emotion with its physiological accompaniments; he attributes to James the view that consciousness is purely intellectual, ignoring the fact that for that writer the emotion is the perception of the bodily changes and that he based his theory entirely in the first instance on introspection. Eastman (9), on the other hand, assumes the theory and gives a concise exposition of recent work by Cannon, Crile, O'Shea and others which, according to him, supports it; the facts, however, seem clearly capable of different interpretations.

In the field of pathology Dide (6) seeks to distinguish and relate the psychosis of "impassioned idealists"—unbalanced reformers, etc.,—described by him in a recent book, in the group of otherwise recognized disorders. It is distinguished, e. g., from the *délire d'interpretation*, of which Libert (15) reports a modified case interesting to the ordinary psychologist chiefly as an illustration of the affective determination of the thought-processes. Régis and Hesnard (20), in opposition to the contention of Babinski and Dagnan-Bouveret that the accidents of hysteria are never caused by emotion apart from a suggested idea, report the case of a man of recognized hysterical character who suffered an attack of dumbness which came on suddenly as the direct result, according to the evidence, of a violent emotional shock in nightmare without any trace of previous intellectual preparation. Reasons are given for the belief that emotional hysteria is often closely connected with the dream-life, but the authors decline to dogmatize on the mechanism of the process.

Fanciulli (10) gives as the general characteristics of the affective life of little children, abundant quantity, high intensity, brief duration and the predominance of emotion over sentiment; he also sketches an outline of its development.

From the positive pleasure of the gratification of appetite seeking to remove the unpleasantness of want, Sternberg (25) draws the curious inference that the modern total abstinence movement simply shows ignorance of the physiology of enjoyment. An article of peculiar general interest to the student is that of Kutzner (14) expounding and criticizing the feeling-psychology of Wundt. The criticism is thorough, yet sympathetic and discriminating; we seem to see the whole structure raised by Wundt tottering, and we are left, in the end, with a clear and dignified impression of its impor-

tance. The conclusion of greatest significance in the view of the writer is that the doctrine of elements with which Wundt begins is traversed and overwrought by his later doctrines of creative synthesis and apperception, meaning the total organization of past experience. This is the source of manifold obscurities, and difficulties in understanding him. "With the introduction of the idea of creative synthesis the doctrine of elements has attained its ultimate consequences and is already condemned; with the introduction of the idea of apperception, in the sense defined, psychological investigation is pointed to a new path different in principle from the theory of elements." Sichler (**22**) defends against another critic Wundt's identification of feeling and will and his tri-dimensional theory of feeling, but does not touch the more serious objections which, e. g., Kutzner brings out against the latter.

The question of affective memory is again brought up by Sollier (**24**), who thinks its existence sufficiently proved by the fact, which he has no difficulty in establishing, that an affective state formerly experienced can recur to consciousness and be recognized as having been experienced before. The strength of the opposite contention lies in the denial of a memory-image of the affection, as such. This raises the whole question of the place of imagery in the memory-process. Is a specific image of the thing remembered essential in any case? Sollier does not discuss this question of images. He refers the conservation and revival of conscious phenomena to cœnæsthesia, which connects all *our* experiences with the sense of *our* personality and which envelops and includes the kinæsthesia, to which Ribot has justly of late ascribed a leading rôle in the processes of the mental life.

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ATTENTION

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There are two articles on the general nature of attention. D'Allonnes (1) interprets attention very broadly to mean the general understanding of experiences. He distinguishes four main levels. At the first, sensory attention, the conditions are physiological and unconscious, attention is induced by strong stimuli and accompanied

by reflex movements. In the second stage, perceptive attention, the interpretation of the presentation is in terms of the residue of experience and of associations. These residues act first to complete the object and in the second place serve to select what shall be seen. The two higher stages, the apperceptive and the logical differ from this only that the interpretation in the one case is in terms of preformed schemata, and in the other of logical concepts. The article is really a discussion of the entire topic of perception rather than of attention. Hicks (7) approaches the problem of attention from the genetic standpoint. He first rejects both of the theories suggested by Lotze that attention is either a sort of illumination of the object by consciousness or a result of the strength of the presentation itself. Rather one must assume that consciousness before it has become differentiated implies a capacity for discrimination as well as mere passivity. Discrimination comes through separate repetitions, through the attraction of the affectively toned presentation, through the reflexly excited movements. As time goes on repeated discrimination of a content with assimilation to similars develops clearness, which is therefore derived rather than immediate as Titchener asserts. In mature years attention is the outcome of accumulated experience, and action is to be regarded as dependent upon attention or the developed cognition rather than attention upon movement. Effort, even, is not a direct gauge of the amount of attention nor of the activity of mind. Dallenbach (3) combines in his study a measure of attention with a test of Titchener's two level theory of consciousness. As a measure of attention, appreciation of changes in the intensity and pitch of tones from a Stern Variator, counting cork balls and adding numbers were used under various distractions. The subjects were asked to grade the clearness of the impression during the period of introspection immediately following the experiment and these results were correlated with the objective results of the measurement in terms of the number of changes overlooked or of the mistakes in counting cork balls or in adding. In one set of tests the changes in tones alone were used under different degrees of distraction, in another two tasks were set to be performed simultaneously. In all of the experiments there was a close correlation between the degree of attention as estimated subjectively and the objective results as measured by the success with the task, the length of reaction time and the size of the mean variation. The distractions served in every case to lessen the degree of attention. All three of the subjects used were of the two-level type of consciousness.

Five papers are devoted to discussions of the duration of attention or the "attention wave." Flügel (5, 6) investigates the conditions that induce changes in the interpretation of figures drawn in ambiguous perspective, in two papers. In the first he is concerned to determine the factors that determine reversal. First he eliminates general factors and eye-movements by examining the fluctuations of two figures when a point midway between them is fixated. That the two figures may fluctuate independently shows no general factor can be responsible, and the fixation should eliminate eye-movements. This latter was also shown not to be present by fixating a point on a small black square placed in the middle of a figure. No tendency was observed for the eyes to move as Wundt's theory demands. It was shown that attitude plays relatively little part by using the frustrum of a prism with figures drawn on it to give the impression that it represented the inside of a room. These favored the concave impression, but the convex still came at times. The conclusion of the author is that direction of attention is the prime factor. The part of the figure that receives full attention is seen forward. In the second paper (6) Flügel deals with the influence of local fatigue upon reversal. For material he uses MacDougall's "windmill illusion." The fatigue is induced by observing it binocularly when rotating in the direction it is desired to fatigue, while tests are made by observing uniocularly. The results show that some few subjects fatigue, the majority do not. Of those that fatigue some fatigue more for one direction or phase, others more for the other. The fatigue is local not general as distraction during the fatigue did not effect the results. Ferree (4) brings new arguments against Heinrich and Chwistek's assertion that the fluctuations of point areas are due to changes in accommodation. He finds more aphakial subjects who get the fluctuations and feels sure that the changes in the images of the opthalmometer that the others mistook for signs of changes in the lens are due to eye-movements. He repeats the experiments of his earlier article that convinces him that the fluctuations are due to retinal adaptation with the recovery due to eye-movements. Billings (2) made measurements on the duration of attention to supraliminal stimuli and found the maximum much smaller than the so-called attention wave discussed above. He was led to his experiments by the fact that one frequently misses the appearance or disappearance of the stimulus or the moment of change. This indicated that there was another periodicity superimposed upon the first. Experiments with twenty-

one subjects indicated that attention can be kept upon a small object for a period of less than two seconds. The subjects used most gave a median of 1.69 secs. The distracting experience is either another object or an idea. Effort to hold attention was not effective in prolonging the period. Billings concludes that the average maximum duration of attention is very short—between one and a half and two seconds, and is in no way related to the longer usually called "attention waves." Pillsbury (8) suggests that if one considers that each recorded change consists of two waves, one the change and the other the awareness of the change, the values given by Billings should be divided by two. The resultant value corresponds approximately to the refractory period of the reflex, in Sherrington's terms, on the one hand and on the other to a number of times in different mental operations that have been referred to the attention wave or that probably have approximately the same conditions in the nervous systems, as e. g., the indifference period in time estimation, the simple association time, the best period of preparation in reaction experiments, etc.

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TIME AND RHYTHM

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Ruchmich (6) publishes a bibliography of rhythm containing over 360 titles, and asks for corrections and additions. He also reports (5) introspections of nine observers who were submitted to

rhythmic stimuli under carefully controlled conditions, using objective intensity, duration and pitch accent, and no objective accent. He concludes from the evidence that "kinæsthesis was essential for the establishment of a rhythmical perception," but that "once established," it "might be consciously carried on, in the absence of any sort of kinæsthesis by auditory or visual processes." Swindle (7) describes some experiments on the formation of rhythmic motor habits, and (as the reviewer gathers from a confused report) finds that the habit is more easily and permanently formed when different arm movements are cyclically grouped, than when repetitions of the same movement are grouped, as by counting them. Five-rhythms and seven-rhythms seem to have been easily learned. The author concludes that "rhythm is acquired by each individual, and that it is not inherited."

Boquet (2) presents impartially the results of observations by astronomers on the frequency of report of the different tenths of seconds when estimating a transit by the eye and ear method, showing individual habits in avoiding particular tenths.

Thumb (8) has made a statistical examination of certain classic and later Greek texts (Plato, Xenophon, New Testament, Demosthenes), computing from only a few hundred consecutive syllables in each case, to determine the relative frequency of long as compared with short syllables, and accented as compared with unaccented; also to determine the relative frequency of groups of 1, 2, 3, and more short syllables between successive long syllables, and in a similar fashion the frequency of the different groups of unaccented syllables between successive accented syllables. The actual rhythm problem of the grouping of short and long (and accented and unaccented) syllables in prose is not touched upon.

Verrier (9 and 10) presents arguments and measurements to show that poetical and musical rhythm is founded on an ideal equality of feet or measures, but this equality is only approximated in practice. The rhythm is practically good when it coincides with the inner or individual rhythm, which permits of considerable adaptive variation. Charon (3) attempts to apply to piano technique elementary physiological and psychological facts concerning the activity of voluntary muscle, and deplores the increasing elimination of rhythm in modern musical practice.

Decroly and Degand (4) present a biographical study of the appearance in a child's vocabulary of words expressing time relations, and infer therefrom that the notion of time develops slowly.

The study will be found interesting by anyone who takes such studies seriously.

Benussi's book (1) is the most important publication of recent years; it summarizes the older and recent experimental work, and so fills a long felt want, but suffers from an excess of constructive and postulatory material which is by no means an aid to the student.

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PSYCHOPHYSICAL MEASUREMENT METHODS

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In most experiments by the method of constant stimuli seven comparison stimuli are used. In this one follows a suggestion of G. E. Mueller, but there exists no reason for choosing this particular number of stimuli, since theoretically two are sufficient. Using fewer comparison stimuli obviously reduces the amount of labor in collecting the data, and it also has the further advantage of avoiding very large differences between standard and comparison stimuli, which always are more or less of a difficulty for the experimenter. These differences, indeed, not only serve as landmarks in the series and may possibly give some information to the subject in

regard to the objective relation of the stimuli, but they also interfere with the correct performance of the experiments, since the subject finds less difficulty in judging them and approaches the other more difficult judgments in a somewhat careless manner. Fernberger (1) studies the effect of shortening the series by recalculating the data of his experiments on lifted weights, omitting the results for the largest and the smallest comparison stimulus. The results show that this omission has practically no influence on the values of h and S and that he might just as well have used the shorter series. There are certain indications, as a matter of fact, that his results would have been better in this case. Investigations of this kind will make the method of constant stimuli a more practical method than it is now.

Gemelli's little book (2) has the purpose of introducing psychophysics into Italy, where experimental psychology is practically unknown and encounters the familiar opposition of philosophers. He justifies the experimental method in psychology by proving that its results are not in contradiction with spiritualistic philosophy. The reader conversant with the scientific movement will find nothing new in it, but the book is very pleasingly written and makes good reading.

Gemelli's study of the method of equivalents (3) very likely is the most important experimental contribution of the year. His experiments, for which he invented a new æsthesiometer, referred to the comparison of cutaneous distances in different parts of the body. He proceeds by what he calls the procedure of minimal variations in the method of equivalents—technically known as the procedure G_1. The results, each one of which is based on 10 observations, are given in great detail and promise to be very valuable. It is found that the ratio of the subjective equivalent to the objective value depends on the standard stimulus. For threshold values of the standard this ratio is high, but decreases with increasing standard stimuli and reaches a minimum for about 6 cm., from which value on it seems to increase again. Gemelli's numerical values of this ratio resemble those found by Miss Washburn. This ratio is also affected by the pressure exerted on the skin, and it differs the more from unity the lighter this pressure is. This seems to be due to the increasing difficulties which the subject finds in forming the judgment. The influence of optical images is studied by determining this ratio for sensations on the forehead and on the forearm in different positions. In one group of experiments the arm is kept

extended along the body, while in the second groups it is abducted as far as possible. In the latter case the results show a considerable underestimation and Gemelli believes that this is due to the influence of optical images. This he tries to prove by the results of a similar series of experiments on two subjects blind since birth, whose results in these two groups do not show such a difference. The third part of the book, in which an introspective analysis of the process of forming the judgment is given is of considerable interest. The formation of a judgment is regarded as a thought process, which is analyzed by the methods worked out by Külpe and his school. The book contains a large amount of very valuable information and it is to be hoped that similar monographs may be written on the other psychophysical methods. The third part particularly shows very plainly that the chief utility of the psychophysical methods consists in their usefulness for the analysis of complex processes. Gemelli asserts that the method of equivalents does not give a measure of sensitivity. This may be true of the way in which this method is usually handled, but considering its close relationship with the method of mean error one may very well believe that some measure will be found. Some of the fundamental problems of the method of equivalents are not even mentioned, which is very likely due to the fact that Gemelli is not conversant with the recent investigations on the point of subjective equality.

G. E. Müller, in discussing the value of the method of mean error, insists on its lack of precision in the definition of the conditions under which the experiments are performed. Add to this the necessity of introducing for the purpose of calculation certain assumptions, which more or less certainly are not justified. One of these assumptions refers to the frequency with which the subject prepares the different values of the comparison stimulus, and it is quite obvious that the chances of obtaining a certain stimulus as a final determination materially depend on the frequency with which it is judged. Stephanowitsch (4) tries to study this factor in experiments in which the subject was required to adjust a variable length so as to appear equal to a given standard. The variations of the comparison stimulus were controlled by a micrometer screw with which a writing attachment was connected so that the steps by which the subject approached the value of subjective equality could be determined. From these data a table of distribution is constructed showing for every subject (1) the number of times a given intensity was adjusted and judged, and (2) the number of

times this intensity was obtained as a final determination of the point of subjective equality. The procedure G_1 seems to have given satisfactory results. It is to be regretted that the report of this investigation, which was very carefully planned and well thought out, was written rather carelessly. Tables I *a* and I *b* alone contain not less than 8 errors, and a great deal of caution will be needed in using these data.

Thomson's paper (5) deals with the determination of the probable error in the method of just perceptible differences. Certain formulæ have been given by which the result of this method can be calculated from the observed relative frequencies of the different judgments. The data of these calculations are empirical determinations of certain unknown probabilities and, as such, they are affected by errors of observation. From this it follows that the result of this calculation also will be affected by an error and it is important to determine this, because its value indicates the accuracy obtainable by this method. Several years ago a formula for calculating this quantity was given, but Thomson shows that an error was made in its derivation, and he gives a new formula which I regard as correct.

In his second paper (6) Thomson takes up the study of the variations of sensitivity which occur during the short time of a sitting. This he does by dividing the time of the sitting into ten periods, and determining the sensitivity in each of them. He experimented on the spatial threshold by the method of non-consecutive groups. The threshold falls sharply at first, then slowly and steadily until about 50 judgments are given. After this it rises or changes irregularly, only to show a final drop at the end of the sitting. The idea of this investigation was forecast in Thomson's first paper on the comparison of psychophysical methods, although he indicates there a different procedure. We call attention to the following features of the paper which seem to deserve careful consideration. The first point to be mentioned is the systematic use of catch experiments. There is at present a widespread aversion against catches, chiefly due to the opposition of the Leipsic laboratory. It may be true that they are superfluous in trained observers, but if the psychophysical methods are ever to become useful for clinical and anthropometric work it will be indispensable to provide catches and distribute them most effectively. The present paper shows that they may be useful in experiments even on trained observers, for Thomson draws the correct conclusion from the mistakes on the catches: The results of the entire sitting are

thrown out, if the errors in the catches exceed a certain number. The other point of interest is the analysis of the function of the experimenter, whose influence on the outcome of the experiments must be particularly great in æsthesiometric experiments where his ability in applying the stimulus plays an important part. Thomson kept not only the subject but also the experimenter in complete ignorance of the correctness or incorrectness of the judgment given, by requiring the subject to communicate the judgments to a clerk by signs which were invisible to the experimenter.

Collecting data for the method of constant stimuli takes considerable time, during which the state of practice of the subject is likely to change. For the purpose of studying these variations, the results of my lifted weight experiments were divided in groups of fifty and the constants of the psychometric functions determined in each one of them for all my subjects (7). The results plainly show the influence of progressive practice as far as about the fifth group—exclusive of the preliminary series. From this it follows that the traditional requirement of continuing the preliminary series until the maximum of practice is reached is impracticable on account of the large number of experiments required. Similar calculations were made on Fernberger's results, which led to the same conclusions. The lower limit of the interval of uncertainty remains constant, while this interval and the value of subjective equality decrease. All these changes take place first rapidly, then more slowly and tend toward a stationary condition which is reached after about the fifth or sixth group. These data are sufficient to derive a formula for the progress of practice into which enter (1) the speed with which the subject acquires practice, (2) the maximum of practice attainable, and (3) the state of practice at the beginning of training. The difference between this and the physiological maximum attainable gives the improvement of which the subject is capable.

Psychophysics is the doctrine of conscious phenomena, their conditions, and accompaniments in so far as they are accessible to experimental investigation. One might believe that introspection is an element by which psychophysics differs from the other sciences of observation, but it is shown in my paper (8) that in final analysis all data of experience rest on statements about the presence or absence of certain conscious contents, and that there exists no thoroughgoing difference between the data of psychophysics and those of the other natural sciences. The notion of the probability

of a certain judgment is discussed at some length. Does this notion imply the denial of causal relations between the judgment—or the mental content of which it is a sign—and its conditions? This is not the case when the word chance is taken in its logical meaning, where this word refers to the presence or absence in an object of such attributes as are not included in the definition of the notion to which the object belongs. It is chance for a man to be white, although there exist causes which fully determine for every individual that he should or should not be white. It can be shown that the entire system of propositions, which is called the calculus of probabilities, can be built up on this notion of logical chance, from which it follows that the successful application of these theorems to a certain group of phenomena does not prove that they are not strictly necessitated. This leads to a discussion of those types of mental phenomena in the study of which the notions of chance and probabilities have proved most successful: the theory of errors of observation, the probability of judicial decisions, and the data of moral statistics. The last especially has aroused great interest on account of its bearing on the question of free will. The first two refer to mental contents of cognitive character in the case of which one can not object to their causal dependence on their conditions, because our ideas could hardly have biological value if they were not formed in agreement with the existing conditions. Several solutions of the problem of the regularities of moral statistics have been offered, the cleverest doubtlessly being that of the so-called Moscow school of idealism. This solution is discussed and the reasons why it can not be accepted are given.

In (10) Wirth continues his discussion with Lipps. Wirth's other paper (9) is a comment on a point of my paper (8), where it is shown that the notion of a threshold as used by the older psychophysicist is superfluous and incorrectly formed. Wirth tries to show that this notion does not contain such contradictions.

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CORRELATION

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The new second volume of Meumann's *Experimentelle Pädagogik* (10) sets forth the various problems of correlation and lights them from a quite new angle. Moreover, it marks the progress which the method of correlation has been making since the first edition of this work in 1907. So far as the writer can discover not a coefficient of correlation was quoted in the first edition and there was little or no reference to the subject. On the whole Meumann's discussion of the correlation results in the new volume are rather critical, although suggestive. Correlation, he believes, offers a means of solving the kernel of the problem of development—whether the development of certain traits hinders others, while the training of certain others may further them, and which traits are thus affected. He calls this the problem of "*Bildungskorrelationen.*" By correlation we may study, for example, whether training in concentration of attention necessarily hinders distribution of attention; whether, as Henri and Binet believed, a systematic training in visual ideas of one who is naturally auditorily minded will damage the auditory memory; whether good memory necessarily interferes with independent judgment, abstracting ability with fanciful imagination, or whether there is only the practical difficulty for an individual to develop both; whether the slower learning of the child in comparison to the adult is the result of less concentration of attention or is independent of attention; whether the longer retention by the child is only a result of the learning requiring more repetitions or an elementary capacity for a longer after-effect from a once formed memory disposition.

The examination of purely mental correlations, which Meumann believes is the ideal plan for obtaining a complete picture of general ability, he feels is extraordinarily difficult because the quantitative measures of qualitatively different performances are not, strictly speaking, comparable. The ability to distinguish tones, for example, is mentally so totally different from the learning of nonsense syllables that one must regard the measures for these two performances as entirely incomparable, viz., vibration rates of just distinguishable tones and the number of repetitions necessary for learning. The correlation teaching up to the present time he thinks rests almost entirely upon the comparison of such heterogeneous quantities. Only when relatively like partial mental abilities enter into such performances is a comparison allowable, and then the coefficient must be regarded as no more than the measure of these partial abilities. This insistance upon the analysis of the abilities correlated comes out again in the caution that a complete view of the conditions of ability cannot be secured by merely studying the correlations of intellectual factors, since feeling and will influence them in different ways. To determine whether good memory limits or furthers thought, for example, we must also consider a will factor—the spontaneity and energy with which an individual pursues his thinking.

In commenting upon the correlation between tested ability and school performance, Meumann holds that it is an error of correlation psychology today to suppose that a high correlation between the two is necessarily a criterion for the good quality of both. It may be that they both have the same one-sidedness. It is much more likely that the ranking by the teacher and the psychologist will not agree to a certain degree because they follow entirely different points of view. He finds support for his contention in Stern's discovery of a correlation of only .45 between the teacher's ranking of pupils on the basis of their school performance and, under special instructions, their estimates of the general capacity of the pupils. Moreover, he criticizes the position of Stern and Burt that the higher correlation of the combined results of several tests shows that one test compensates for another, each reaching only one side of the mind, so that only through such compensation would a total picture of intelligence be created. This presupposes, he thinks, that more such tests would not contain any inner opposition, and it especially disregards the fact that the qualitative value of the tests in relation to intelligence is entirely different. It must give a false picture of

the average intelligence of a class if high memory performances compensate for medium thought activities. The fact that a pupil with good memory often has a low type of general ability would be covered up by the simple addition of these numbers. We must control these calculations through an intimate psychological analysis of the abilities tested, otherwise the result of the compensations are only uncertain and "we urge arithmetic instead of psychological examination of ability."

A common note is struck by several investigators who have been employing the method of correlation during the past year. This is the desirability of more intensive study of the factors influencing correlation. One of the most important of these factors is undoubtedly practice and several papers indicate its effect. Unless the great complexity of the factors involved in the correlation of abilities are investigated and allowed for, Brown (1) thinks that "the speculations as to the causes of psychical correlation must be little more than futile," nevertheless he indulges in the liberal conclusion that the causes of correlation are both inner and outer, and that the inner causes are partly general and partly specific. He agrees that Hart and Spearman's paper of 1912 "indicates the probability of a general source of correlation, although the absence of probable errors deprives their conclusions of the quality of mathematical demonstration." His paper is mainly devoted to a critical consideration of Spearman's revised formula for eliminating "observational errors." Using the same criteria he employed in examining the earlier formula he tests the assumptions that these "accidental" deviations are not correlated with each other or with the abilities measured and finds these assumptions are not justified. The empirical data on which he tested the formula included the results obtained by Winch in examining 39 eleven-year old school boys with a simple motor test of marking out all the letters on a page and a complex motor test of marking out the four letters a, n, o, s. The reliability coefficients for the six successive days which the tests were given run very high, from .819 to .952. The effect of practice is shown by the increase in the correlation between the two tests in the successive trials of five minutes each, the series running .29, .44, .59, .48, .47, .50. This negatives the view that correlation is due simply to voluntary attention, lack of practice, or ability to follow directions. Improvement in one series is not very highly correlated with improvement in the other, .28. On the other hand the correlation between improvement and average ability

in each test is fairly high, .78 for the simple motor and .50 for the complex motor test. The variability of the group, as indicated by the coefficients of variability, increases with practice from the first half to the second half of the series with the simple motor test while it remains fairly constant after the second trial with the complex motor test. In a note which is a forerunner of the study of individual variability, in which we may expect investigators in the near future to become interested, he gives the correlations between the individual's average record and his variability in each test as well as between his variabilities in the two tests. These six trials, however, as he says, are not a satisfactory measure of these relations. In place of using Spearman's formula for correcting coefficients he advises obtaining accurate correlation coefficients by taking a large number of measures at fixed intervals. When the means and standard deviations at each trial indicate that the measures are sufficiently constant, then the later measurements should be averaged and the coefficients calculated from them alone. "The 'accidental' as distinct from the 'residual' deviations would thus be approximately neutralized by the law of averages, and their correlations, if actual, would be eliminated with them, while the residual deviations themselves would be reduced to a minimum."

Starch and Hollingworth have also studied the influence of more accurate measures on correlation. Starch (13) finds that the intercorrelations between the grades of pupils in arithmetic, language, geography, and history in the elementary schools, which range from .40 to .50 when the marks are taken for only one year, are all over .73 when the average marks for three years are taken for the same pupils. Reading and spelling show markedly lower correlations than these four studies. Hollingworth (7) presents an admirable study of the effects of practice on the intercorrelations of six laboratory tests from the first trial to the 205th when the limit of practice had been reached for each. The tests used were given to 13 subjects and included adding, color naming, opposites, discrimination reaction to colors, muscular coördination (three-hole test) and tapping. He gives the correlations of each test with each of the others for the first trial and for the median of the last five ending with the 5th, 25th, 80th, and 205th. The final averages of the coefficients for these positions in the series of trials are .065, .280, .320, .390, .490. Except in discrimination reaction to colors practice markedly increases the intercorrelations. The increasing correlation he thinks is to be accounted for by (*a*) decrease in the

individual variability, which affects only the first few trials; (*b*) changes in the character of the tests themselves, a progressive qualitative approximation; and, because the first two are insufficient, (*c*) "some form of the doctrine of 'general ability' . . . But the conclusion seems to call for the qualification that 'general ability' have reference to final capacity rather than to momentary performance, if the correlation is to be high. Give each individual the opportunity to attain to his limit of efficiency, his highest level of performance, and when these final limits are reached individuals who excel their fellows in one type of work will also excel in other types of work." He thinks, moreover, that we have failed to make sufficient allowance for the importance of incentive, motive, attitude and purpose in determining possible achievements. In a forthcoming paper he promises to show that "preliminary tests do not reveal the final relative abilities of the individuals as determined by their practice limits in the same tests."

In line with the suggestions of Meumann the study of Heymans and Brugmans (6) is an interesting early attempt to find the relations of certain general mental functions to each other. With groups of 12 to 15 students they measure memory, fanciful imagination, secondary function, concentration and intellect, each with from three to six tests. In each field, except intellect, the tests show some negative correlations with each other. This is especially true with the tests for memory for different kinds of material. Noteworthy are the high correlation between fantasy and intellect, .94, and the low correlation between intellect and their three tests for concentration, .07. Three out of four of the correlations between secondary function and the others are negative. The authors are especially interested in the relation of intellect to secondary function, the latter tested mainly by the prolongation of the after-effect of sensations in the various fields. Neither the extreme of secondary functioning as found in melancholia or of primary functioning as found in mania would favor high intellectual performance, so that they are not surprised at its low correlation with intellect.

A new use for the correlation method is found by Kelley (9), who employs it in the association experiment as a means for classifying the different types of word associations. This allows him to trace relationships in mental processes which might not be shown by logical classifications. It is a step toward the determination of the types of association that would be found emphasized, for example, in the scientific mind and it opens up a method of approaching

the problem of vocational guidance. Among fifteen classes of word associations Kelley finds three groups that stand out in the intercorrelations. For example, his Alpha group includes reactions by synonyms, contrast words and words of equal logical value (coordination). Correlations are given between the association reactions of the twelve students tested and their class standings in mathematics, science and foreign language. The trend of the investigation is to show that free associations are indicative of the ability of subjects. The most significant features favorably correlated with scholastic rank in the studies named are capability in the recall of particular situations and frequency of reaction with the Alpha group. The most significant features that are unfavorably correlated are frequency of visual imagery repetitions, and the Beta group (reactions with the noun-verb, verb-object and causality relations). The Beta group shows negative correlations of from .44 to .75 while the Alpha group shows positive correlations from .19 to .37. Neither the association reaction time nor its variability is strongly correlated with the grades in the college studies named, although it tends to be negative.

The service of correlation in solving a difficult problem in pure psychology is well demonstrated by Hollingworth's study of judgments of similarity and difference (**8**). Specimens of handwriting were arranged in reference to a standard, under directions which asked for judgments primarily of similarity or of difference. The changes in correlation showed that consistence of judgment on the basis of similarity was greater than on the basis of difference. The correlation was higher for two orders of similarity than for similarity and the reciprocal of the order of difference. The variability among a group is less for similarity. He concludes that judgments of similarity and difference are psychologically different. "Similarity seems to be more fundamental, natural, easy and self-consistent, whether a single individual or a group of observers is concerned."

Three papers contribute more or less directly to the problem of the correlation of tests and ability in school. Scott (**12**) believes that we should expect to find the correlation between estimates of intelligence and ranking in tests closest at that stage of life when growth is practically over and before differentiation has set in to any marked degree, such as he finds represented in the first year pupils in a normal school. After six months' acquaintance the teachers ranked the pupils reciting to them and the pupils ranked those in their section of the class. The 96 pupils were found to

be able to judge their own position relative to the average judgment of their classmates better than could any one of their fellows, the correlation with their self-judgments being .96. The teachers were less in agreement as to the rank of their pupils than were the classmates, but this was partly due to their having only a sixth as much time with the group of pupils in the class room and to the fact that the teachers were ranking the pupils as they appeared in their subject. On the whole the average of the six teachers' judgments correlates with the average of the pupils' judgments by a coefficient of .84. The average of six tests correlates highly with the estimate of the fellow pupils, .74, so that a good estimate of success in school could be made at their entrance and the pupils detected whose capacity was better than their school performance through laziness, timidity or disgust at seeking marks. Wyatt (**16**) tried out eight tests with two groups of school children and found that the analogies and the completion tests gave the highest correlations with intelligence and with the other tests. The correlation between memory for nonsense syllables and the best tests ranges from .5 to .7. The tests retain similar positions for the two groups with a correlation of .89, so that the relative value of the tests as measures of intelligence is quite reliable. The correlations of each test with every other admit of hierarchical arrangement so that Spearman's theory of the General Common Factor receives additional support. By Burt and Moore (**2**) a score or more of tests are given twice to from 65 to 130 school children and their correlations with intelligence estimates and reliability coefficients calculated. The higher and the more complex the process tested the smaller is the sex difference found to be, as shown by a correlation of .65 between the rankings of the tests in these respects.

Struve (**14**) calculates the relation between intelligence, bodily development and fatigue using 119 twelve-year old boys in four parallel classes of the seventh year in a Chemnitz school. One of the classes was composed of bright pupils, one of retarded and the other two of average children. These groups were kept separate in calculating the results. Fatigue was measured by the decrease in rapidity of adding; bodily development took not only size but health into account. Between fatigue and bodily development no correlation was found in any of the classes. Between fatigue and rapidity of addition there was no correlation. Intelligence and bodily development showed a correlation only in the class of bright pupils where it was low. Rapidity of writing numerals and of

adding showed correlations from .60 to .26 in the different groups, it being highest with the backward pupils, where writing continues to require considerable effort. The greatest fatigue was found among the bright and the retarded pupils.

Duchler (4) published the first of a series of papers setting forth in an introductory manner the methods of correlation that are most serviceable for psychology and pedagogy. This paper is devoted to developing two formulæ which are not in common use but are useful for determining correlations when the members of two distinct groups can be compared with each other in pairs as to a certain characteristic, although the members of either group are not easily comparable among themselves as to this characteristic. For example, to determine the correlation between good capacity and good performance when a judgment can be passed upon a pair of pupils, one chosen from a group of good capacity and the other from a group of poor capacity, to the effect that the pupil from the group of good capacity is better, equal or worse than the pupil from the group of poor capacity in a particular performance. Damm (3) works out illustrative examples of correlation for the information of teachers conducting experiments in psychology. Harris (5) provides a method for greatly reducing the labor in calculating intra-class and inter-class coefficients when the number of cases is large. Pintner (11) attempts to determine the correlation between fluctuating attention in the tachistoscopic reading of words and variability in reaction time as evidence that the latter is an indication of fluctuation in attention. Winch (15) uses the correlation of the results of the same group of pupils with two sets of words for standardizing the spelling lists to be used in a research on learning to spell.

It is a pleasure to call attention to the prize of $100 offered for the best paper on the availability of Pearson's Formulæ for Psychophysics, the announcement of which has appeared in the various psychological magazines together with the rules governing the contest. The papers are to be in the hands of Professor Titchener by December 31, 1914.

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SPECIAL REVIEWS

Body and Mind, a History and a Defense of Animism. WILLIAM McDOUGALL. London: Methuen, 1911. Pp. xix+384.

The first six chapters of this book are given to the rise and subsequent history of animism; the following three chapters to a sketch of the adverse doctrine as developed by the practical successes of the mechanical sciences; and the remaining seventeen chapters to a systematic presentation of the philosophical and other arguments against animism and to the author's own admirable exposition and defense of this doctrine. While the volume is frankly written as a defense and vindication of animism, its discussions and presentations are everywhere marked by the most faultless candor and impartiality of judgment. And this feature alone, apart from the further fact that the text is undeviatingly interesting, well-arranged and clear, makes this volume one of the most excellent that has ever been written on this well-nigh cardinal philosophical topic.

The author expressly disclaims having any new material to present in the historical chapters, yet he has assembled the facts so well that they yield an enhanced measure of instructiveness. Here one sees again that history is intelligible when, and only when, it is the warp and not the woof of the web of time that is studied. Forces operate continuously down the temporal series, and the consecutive history of a single line of thought reveals the force and the necessity of nature's workings as they can never be revealed in a series of cross-sections, in detailed pictures of the multifarious forces interacting at an epoch. Thus the slow attenuation of primitive anthropomorphism, with its gross conceptions of the "ghost-soul," nature-gods and demons, to the less substantial animism of the Greeks and Romans, on to the spiritualism of the early Fathers, and then on to the soul-doctrine of later and present-day theology, philosophy and psychology—makes an interesting study. And on the way one is led to speculate, indeed to prognosticate, how far such attenuation is destined to proceed.

The counter-movement against animism is presented with perfect fairness: indeed Professor McDougall has run the risk that his readers will be irretrievably convinced that mechanism holds full sway in this universe, before they reach his own systematic

vindication of animism. This shows only, however, that the author knows exactly what he is writing about, and surveys it broadly. Of especial interest is Chapter VIII., The Rise of the Mechanistic Physiology and of the Psychology Without a Soul. Here one sees how slowly the soul has been squeezed out, so to say, from any last foothold in the nervous system. From the voluminous accommodations, the bowels, stomach and brain, assigned to the soul by the earliest psychologists, it was forced into the single compartment of the brain, then into the very cramping pineal gland: then it was dismembered or indeed pulverized and distributed atom-wise to the "cell-bodies"; now it is by some forced to remove to the cortical synapses, by others swept out altogether. The excellent point is made that Kant's philosophy has not touched nor in any wise relieved us from the psychophysical problem. And as much might be said of the other idealists.

Professor McDougall's discussion of the outstanding "solutions" of the psycho-physical problem is extended, clear, scholarly, and, when one reflects what a hoary old topic it is, astonishingly original. It will seem strange to some readers that epiphenomenalism, psychophysical parallelism, phenomenalistic parallelism and psychical monism (the last two being "identity"-hypotheses) are designated as "anti-animistic" solutions of the problem: strange inasmuch as the first two at least are ordinarily called dualistic. For the author any sort of parallelism is monistic (p. 355) and is opposed to Animism; and against all varieties of the former he adduces good (and in your reviewer's opinion, conclusive) arguments. By "animism" Professor McDougall means a rigorously dualistic interactionism, with the emphasis, perhaps, on the dualism. The author finds many reasons for reasserting the dignity of the soul and its distinctness from mechanical nature; notable among these reasons are the empirical phenomena of memory, unity of consciousness, and the "meaning" of things; and, as a last, perhaps great, reason he finds (p. 194) "that Animism, or the dualistic doctrine of soul and body reciprocally influencing one another, is the only psychophysical theory logically compatible with Theism, with a belief in a personal God, a Divine Creator, Designer and Ruler of the World." The phenomena of "meaning," memory, and unity of consciousness have "no immediate physical correlate in the brain." Indeed the active and efficient Anima is found to be essential to the operation of practically all, even the simplest, of the animal functions. For (p. 266) "no adequate mechanical explanation of the

scratch-reflex has been suggested; and it may be argued with at least equal plausibility that the analogy between the processes shows that the scratch-reflex, like the instinctive expression of distress, involves some factor incapable of description in mechanical terms"; *i. e.*, an animistic factor. The arguments adduced in these connections, it should be noted, are far from being the time-worn phrases that one finds in every text-book of philosophy and psychology.

As nearly everyone is aware, the "Soul," whatever the arguments that urge one to believe in such a thing, is not, or at least has not been, a fruitful *explanatory* concept in psychology. And so the pertinent question arises in the reader's mind—"Now that you have got your Soul, what are you going to do with it?" Some suggestions of an answer to this question are given; but to the reviewer's mind these constitute the least satisfactory aspect of the volume. But of course it could be contended that the answer to this question lies beyond the scope of a "*defense*" of animism.

All in all the book is a noteworthy achievement. At every point the author writes from a direct examination of the relevant facts, transcribing his immediate vision of them and not mouthing the stale formulæ of the innumerable previous disputants on this topic. He has produced a very worthy monument to Animism.

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NOTES AND NEWS

DR. DAVID CAMP ROGERS, associate professor of psychology in the University of Kansas, has been appointed professor of psychology in Smith College, to succeed the late Professor A. H. Pierce.

DR. LUCY M. DAY, of Vassar College, has been appointed instructor in psychology in Wells College.

DR. GERTUDE RAND, demonstrator of psychology in Bryn Mawr College, has been promoted to the grade of associate.

PROFESSOR J. H. LEUBA, of Bryn Mawr, will be absent next year on sabbatical leave. His courses will be given by Professor E. Wilm, of Wells College, and by Dr. Chester E. Kellogg.

PROFESSOR J. E. W. WALLIN, of the University of Pittsburgh, has been appointed director of the Psycho-Educational Clinic in the

Public Schools of St. Louis, Mo. The Clinic will be closely affiliated with the Harris Teachers College and lecture courses will be offered in the extension division of that institution.

WE HAVE received the first number of a new bi-monthly magazine called *Revue de Pédotechnie* edited by Dr. Decroly of Brussels and published by H. Lamartin, rue den Berg 58, Brussels, Belgium. The magazine, as its name implies, is to be devoted to researches regarding the practical applications of education. The first number includes among others an article by Dr. Decroly on The Application of the Binet-Simon Tests to Homogeneous Classes.

A PRELIMINARY announcement has been sent out of the International Congress of Neurology, Psychiatry, and Psychology, to be held at Bern, September 7–12, 1914. Seven topics for report are assigned to the psychological section: mental heredity, the education of young criminals, psychology in the school, the biological bases of psychology, mental tests, the unconscious, consciousness, and attention, and the psychology of dreams. Those wishing to attend should address the Secretary, Dr. L. Schnyder, 31, rue Monbijou, Berne, Germany. In accordance with the prevailing European custom, a membership charge of 25 francs is exacted of members to defray the expenses of the congress; wives and children of members are admitted at half price.

OUR readers are reminded of the Fifth International Congress of Philosophy to be held in London during the last of August under the presidency of Dr. Bernard Bosanquet. One section of the Congress will be devoted to psychology.

THROUGH the co-operation of the estate of the late Dr. C. Annette Buckel of Oakland, a research fellowship for the study of feeble-minded children has been established at Stanford University. The department of education, under the direction of its head, Professor E. P. Cubberly, will have the appointment of the fellow, who will work in cooperation with Professor Lewis M. Terman. The first appointment will be for the academic year 1914–15. This is the first foundation for this sort of work in any California university. The income amounts to about $500 a year, and the board of trustees of the university have added an additional $500 to the fellowship. It is hoped to increase this sum so as to make possible a thorough and constructive study of the whole problem of mental deficiency.

THE following are taken from the Press:

DR. OTTO KLEMM, docent at Leipzig, has been appointed professor of psychology in Alberta University, Edmonton, Canada.

DR. MARY T. WHITLEY has been promoted to the grade of associate professor of educational psychology at Teachers College, Columbia University.